Evidence Paper

Effectiveness of the AstraZeneca vaccine on the various variants

Multiple variants of the virus that causes COVID-19 have been circulating globally and within the United Kingdom. Viruses constantly change through mutation, and new variants of a virus are expected to occur over time. Sometimes new variants emerge and disappear. Other times, new variants emerge and persist.

VOC-202012/01 (B.1.1.7) was initially detected in the UK and was first sequenced in the UK in September 2020. This particular variant has affected more than 200 000 people in the UK. According to data reported up to 14 April 2021[1], there are 4 'variant of concern' (VOC's) existing in the UK. There are another seven variants currently under investigation (VUI), which account for around 700 cases altogether.

Referring to University of Minnesota[2], Centre of Infectious Disease Research and Policy, the AstraZeneca COVID-19 vaccine is 70.4% effective against the B117 variant for symptomatic COVID-19 cases and 28.9% effective at preventing asymptomatic infections or cases with unknown symptoms. Through a clinical trial, the scientists also identified that the vaccine was 81.5% effective in preventing symptomatic COVID-19 caused by non-B117 strains

Data suggest that vaccines currently deployed in the UK (Pfizer/BioNTech , Moderna and Oxford/AstraZeneca) seem to be effective against the (Kent) B.1.1.7 variant, but less so against the (South African) B.1.351 variant[3]. Most of these studies are based on antibodies and therefore provide only a partial understanding of the overall immune system response. Studies on the effectiveness of vaccine-trigger T-cell responses are limited. The Oxford AstraZeneca team[4], announced they were already looking at updating their vaccine to make it more effective against the mutations that are being seen and it could be available by the autumn. It is possible it could take the form of a one dose booster which is updated and rolled out every year

The below table portrays the neutralising activity of antibodies triggered by the vaccine currently deployed in the UK against the most common variants of concern in the UK, expressed as compared with wild-type SARS-CoV-2. The term 'fold' found in the below table, is the change in measure describing how much a quantity changes between an original and a subsequent measurement.

Vaccine	B.1.1.7 (Kent)	B.1.351 (South Africa)	P.1(Brazil)

[1] https://post.parliament.uk/which-sars-cov-2-variants-reduce-the-effectiveness-of-vaccines/
[2] https://www.cidrap.umn.edu/news-perspective/2021/03/astrazeneca-covid-vaccine-70-effective-vs-b117-variant#:~:text=Overall%20efficacy%20was%2061.7%25%20against,caused%20by%20non%2DB117%20strains.
[3] https://post.parliament.uk/which-sars-cov-2-variants-reduce-the-effectiveness-of-vaccines/
[4] https://www.bmj.com/content/372/bmj.n359

Oxford/ AstraZeneca	8.9-fold reduction (although efficacy against symptomatic disease is 70.4%)	between a 4.1 to 31.5-fold reduction	Minor reduction (2.9-fold)

A more recent, South Africa-based study on 2,026 participants aged between 24 and 41 years found that the Oxford/AstraZeneca vaccine was only 10% effective against mild disease from the B.1.351 variant. Neutralising antibody activity against the B.1.351 variant was evaluated in 12 participants: seven had no detectable activity and five showed between a 4.1 to 31.5-fold reduction. Analysis of vaccine-triggered T-cells in 17 participants found that these should still be able to recognise several components of the spike protein of the B.1.351 variant.

Discovery of the Indian COVID-19 variant first appearance (B.1.617) in October 2021, much of the data around the India variant is incomplete according to scientists. With very few samples being shared - 298 in India and 656 worldwide, compared with more than 384,000 sequences of the UK variant, scientists[5] don't yet know how effective the Pfizer/BioNTech, Oxford/AstraZeneca or Moderna vaccines will be at protecting against the B1.617 variant, but there isn't any evidence that they won't be protective. Further evidence will become available regarding this type of variant in time.

Results from WHO Strategic Advisory Group of Experts on Immunization (SAGE)[6], confirm we must do everything possible to reduce the circulation of the virus, prevent infections and reduce the opportunities for the SARS-CoV-2 to evolve resulting in mutations that may reduce the efficacy of existing vaccines. An alternative method of resolving the issue is to update current vaccines which could include additional booster doses, multivalent or universal vaccines, mix and match strategies, or whole-inactivated virus vaccines.

Trials

According to The Guardian[7], clinical trials of vaccines against new variants of coronavirus will start in the summer to ensure updated boosters are available for the autumn if needed, Oxford's lead vaccine researcher has told MPs.

Updated versions of the vaccine are being developed as a precaution in case new variants of coronavirus substantially evade immunity provided by the shots being administered today.

[5] https://www.bhf.org.uk/informationsupport/heart-matters-magazine/news/coronavirus-and-your-health/covid-variant#INDvariant

[6] https://www.who.int/news/item/08-02-2021-covax-statement-on-new-variants-of-sars-cov-2

[7] https://www.theguardian.com/world/2021/feb/24/vaccine-clinical-trials-for-covid-variants-to-start-in-summer-mps-told

While it is still uncertain whether the vaccines will need to be changed, Gilbert said the necessary work had begun and a decision would need to be taken in the summer.

Further trials are under way to assess whether mixing vaccines provides better protection by stimulating the immune system in different ways. Other options under development are vaccines based on nasal sprays and pills

Conclusion

The AstraZenica vaccine is still proving effective against the variants as it stands but efficacy varies depending on the variant, as explained in this paper. It is still therefore pertinent to mitigate risk through testing regimes, to identify cases and manage them to avoid risk to the community.

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